SP Energy Networks

Redshaw 400kV Substation
Substation Appraisal – Supplementary Report

Final Report
Prepared by LUC
May 2023

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11980

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Chapter 1
Introduction

Introduction

1.1 SP Energy Networks (SPEN) is currently proposing a new 400kV/132kV substation at Redshaw (the Proposed Development).

1.2 Owing to the nature of the future renewable energy projects that are planned for the area, the chosen site for the Proposed Development will also have scope for future expansion to meet the need for these renewable energy projects to be connected to the grid. It is anticipated that approximately 2 gigawatts of renewable energy will be generated from these developments.

1.3 The existing transmission grid infrastructure in the South of Scotland will, in the next few years, be operating at full capacity and will therefore no longer be able to accommodate the planned and potential new generation in the area. Therefore, SPEN is required to reinforce the network to facilitate future connections and ensure the network remains fit for purpose. The Proposed Development will provide security to existing supplies as it will create an alternative 'feed' should a catastrophic event occur on the system at Kilmarnock South. This will give more reliability to the network and ensure power continuity.

1.4 A high level environmental and technical substation siting study was undertaken for the Proposed Development, located in an area next to the existing 400kV ZV route.

1.5 The overall aim of the substation siting study was to identify the most appropriate site for the proposed 400kV/132kV substation, reflecting known environmental considerations and technical considerations identified by SPEN. The findings of the substation siting study are presented in the Redshaw 400kV Substation – Substation Siting Study (LUC, March 2023)[1].

1.6 The substation siting study which involved the appraisal of three substation siting areas (SS1, 2, and 3), concluded with SS2 being the preferred site. Subsequently, SPEN identified an alternative site immediately adjacent to SS2 but sited to the south of the existing 400kV ZV route. This has

[1] http://spenergynetworks.co.uk/pages/redshaw_400kv_substation

been termed substation siting area (SS4) and has been subjected to the same level of environmental and technical appraisal as SS1, SS2 and SS3. The rationale for the technical led identification of SS4 by SPEN, and the findings of the appraisal process are presented in this supplementary report.

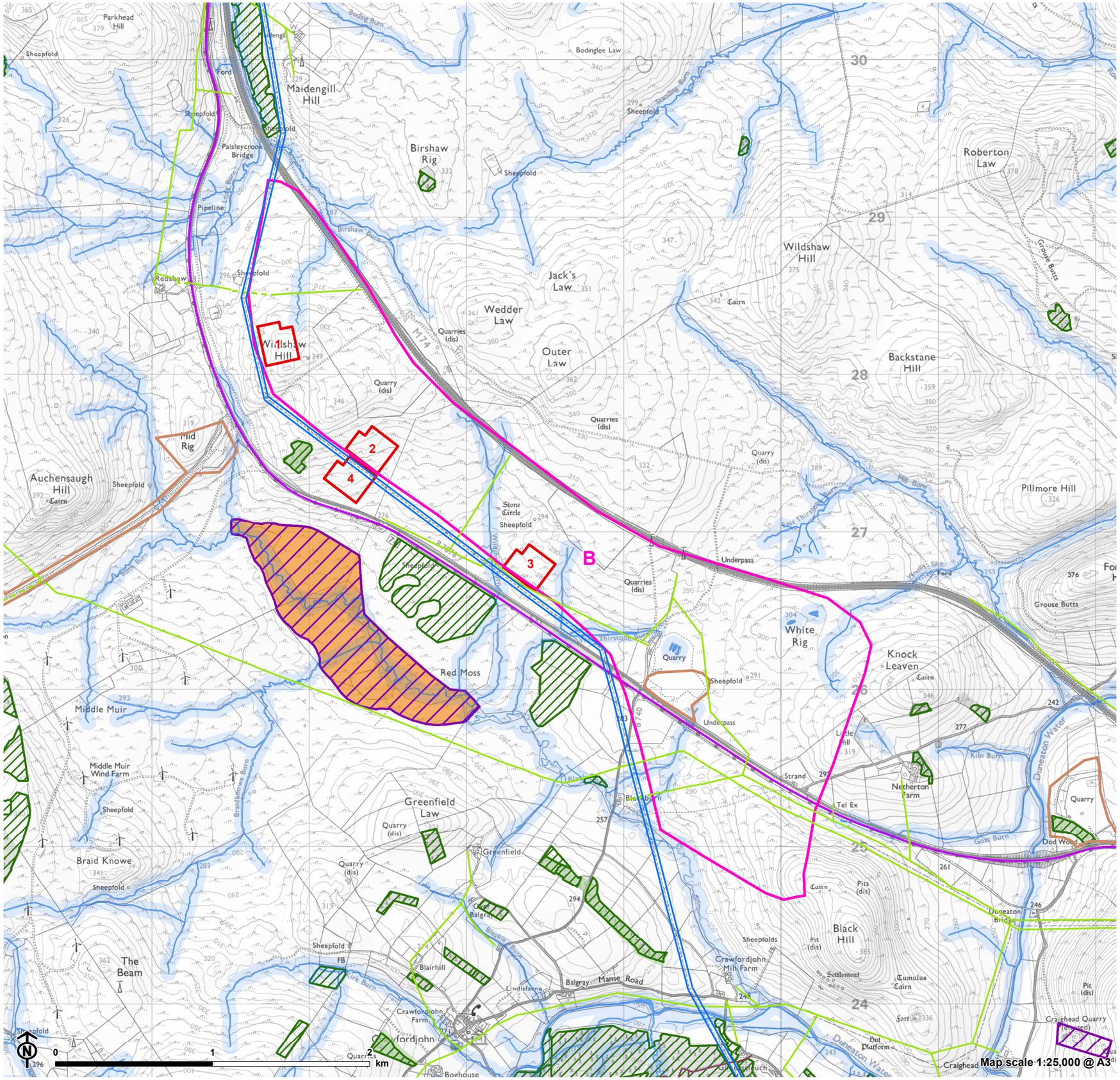
Identification of Substation Siting Area 4 (SS4)

1.7 SS4 was identified by SPEN based on more detailed technical, environmental and economic assessments after the initial findings of the siting study which concluded that SS2 was preferred. SS4 has been identified to also meet the objectives of being within proximity to the existing ZV 400kV OHL and able to accommodate new proposed OHL connections. The location was identified as a site which is located between towers ZV109 and ZV110, where it is considered that the existing tension towers would give the ability to divert the existing OHL circuits, whilst two new terminal towers would be constructed in place of tower ZV110 to turn both circuits into the new site. SS4 is located to the east of tower ZV110 to satisfy these technical requirements. Landscape fit and the presence of existing features to integrate and where possible screen the substation infrastructure was also taken into consideration.

1.8 SS4 has been identified to have minimum impact to the environment by reducing cut and fill activities to minimise the earthworks required by approx. 50% in comparison with SS2.There will be a minimum impact to 400kV ZV line if the orientation is modified, and the substation moved to the south of the ZV line (instead of the north where SS2 is proposed). Easy 'loop-in and loop-out' (LILO) of the line would be possible Moreover, there will be a locational benefit to the ZV line being turned into the substation and the location will minimise impact to the ZV line during the construction phase due to fewer tower modifications being required.

1.9 The various 132kV connections coming from the B708 roadside and beyond will make it easier to connect into the substation if the orientation/siting is changed from SS2 to SS4. Therefore, the area that would have been required to turn the line from the earlier planned SS2 area will be reduced. The findings of the application of the environmental appraisal criteria to SS4 are presented in Appendix A. The location of SS4 in relation to the environmental considerations can be seen in **Figures 1.1, 1.2** and **1.3.**

Figure 1.1: Substation Siting Areas



- Substation search area
- Substation siting area
- Mineral Development Sites (Indicative)
- 400kV OHL
- 11kV OHL
- 11kV UGC
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Ancient Woodland Inventory (AWI)
- National Forest Inventory
- National Cycle Network
- Core path
- Watercourse
- 50m watercourse buffer

Notes:
The Mineral Development Sites have been digitised from the South Lanarkshire Local Development Plan 2 proposed plan: Minerals map.

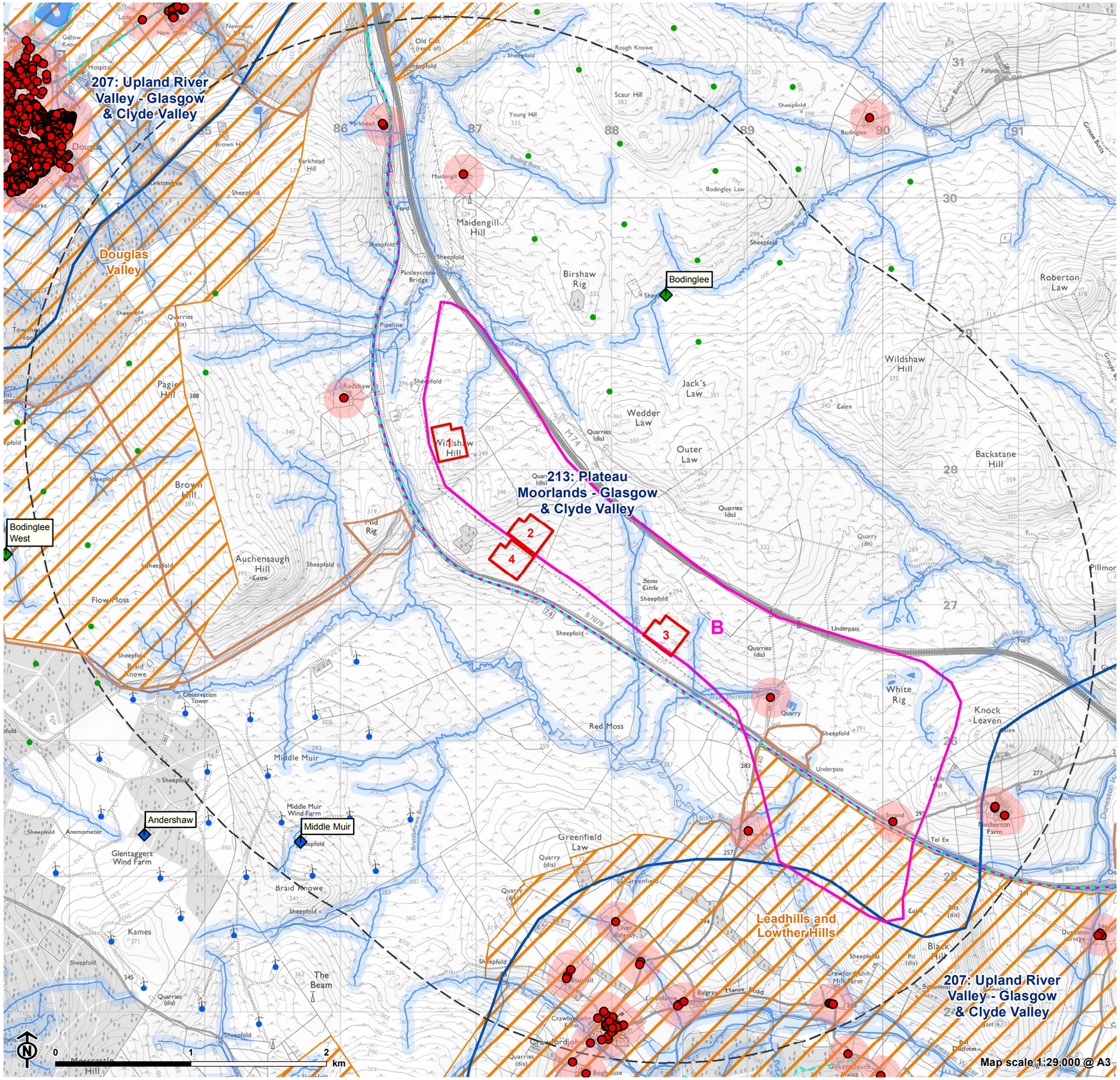
The Central Southern Uplands Environmentally Sensitive Area (ESA) covers the entirety of the study area and is not illustrated on this figure.

For data licencing reasons, the SEPA 1:200 year flood risk zones are not shown on this figure. These can be viewed at the following link: https://www.sepa.org.uk/environment/water/flooding/flood-maps/

CB:JH EB:Harbich_J LUC FIG1-1_11980_SubstationSitingArea_r0_A3L 25/05/2023
Source: LUC, Sustrans, SPEN, South Lanarkshire Council

LUC

Figure 1.2: Landscape and Visual Study Area



- Substation siting area
- L&V study area (3km buffer)
- Substation search area

Wind Farm (by status)

- Operational
- Design/Scoping
- Mineral Development Sites (Indicative)
- Watercourse
- 50m watercourse buffer
- National Cycle Network
- Core path
- Residential Property
- 150m property buffer
- Special Landscape Area
- Landscape Character Type
  - 207: Upland River Valley - Glasgow & Clyde Valley
  - 213: Plateau Moorlands - Glasgow & Clyde Valley

CB:JH EB:Harbich_J LUC FIG1-2_11980_LVStudyArea_r0_A3L 25/05/2023
Source: LUC, SPEN, Sustrans, South Lanarkshire Council

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Figure 1.3: Cultural Heritage Considerations

- Substation search area
- Substation siting area
- Archaeological constraint area (200m buffer)
- Category B Listed Building
- Scheduled Monument
- HER site (archaeological constraint)
- Non-Statutory Register (NSR) site

Map scale 1:29,000 @ A3

CB:JH EB:Harbich_J LUC FIG1-3_11980_CulturalHeritageConsiderations_r0_A3L 25/05/2023
Source: LUC, SPEN, West of Scotland Archaeology Service

Appendix A

Substation Siting Area 4 Appraisal Table

Table A.1: Table Environmental Appraisal Table for the proposed 132/400kV Substation Siting Area 4

Criterion	Sub-Criteria	Substation Siting Area 4 (SS4)
Landscape and Visual Amenity	Land Use, Landcover, Terrain, Visual Amenity and Potential Opportunities for Additional Mitigation.	Substation Siting Area 4 extends across low lying and gently sloping terrain north of the B7078, between approximately 280m AOD and 310m AOD. It is located directly east of tower ZV110. Substation Siting Area 4 will be evident in views from M74, B7078 and the National Cycle Network (NCN) Route 74, but views will be limited to short sections of these routes. The visibility of SS4 from the periphery of the Douglas Valley SLA to the west, north-west will be limited by intervening landform. Existing landform sloping to the north and north-east provides opportunities to integrate the development into the existing landform (embedded mitigation), and screen or reduce perceptibility of the substation site in views from the M74, and opportunities for further additional mitigation to be incorporated around the site. Less extensive earthworks (cut and fill) are likely to be required than for Substation Siting Area 2 to establish platform(s) and cut into slopes to north, north-west, may assist with further integrating substation infrastructure in this location.
	Landscape Character Types (LCT)	SS4 is located within the Plateau Moorlands - Glasgow & Clyde Valley LCT. Key characteristics include: ■ *"Large scale landform;* ■ *Undulating hills and sloping ridges in the western areas; a more even plateau landform in the east;* ■ *Distinctive upland character created by the combination of elevation, exposure, smooth plateau landform, moorland vegetation;* ■ *Predominant lack of modern development;* ■ *Extensive wind turbine development, including one of the largest wind farms in Scotland, Black Law; and* ■ *Sense of apparent naturalness and remoteness which contrasts with the farmed and settled lowlands, although this has been reduced in places by wind energy development."*[2]
	Designated Landscapes	SS4 does not fall within any nationally or locally designated landscapes.

[2] https://www.nature.scot/sites/default/files/LCA/LCT%20213%20-%20Plateau%20Moorlands%20-%20Glasgow%20&%20Clyde%20Valley%20-%20Final%20pdf.pdf

Criterion	Sub-Criteria	Substation Siting Area 4 (SS4)
		The north-western extent of the L&V study area includes a small proportion of the locally designated Douglas Valley Special Landscape Area (SLA). Relevant special qualities include "*scenic compositional qualities of a meandering river passing through a sheltered, mature pastoral landscape enclosed by moorland hills.*"[3] The southern extent of the L&V study area includes a small proportion of the Leadhills and Lowther Hills SLA. The special qualities of this SLA relate primarily to the extensive uplands at the core of the designated area. SS4 will be visible from higher ground at the northern edge of the Leadhills and Lowther Hills SLA (within approximately 1.6k-3km).
	Residential Visual Amenity	The nearest property to SS4 is Redshaw (grid ref 286029, 628525) approximately 1.5km to the north-west, from which views will be screened by intervening landform. The Red Moss Hotel (grid ref 287414, 627043) located approximately 350m to the south is currently unoccupied.
Ecology and Ornithology	Environmentally Sensitive Areas (ESA)	SS4 is located within the Central Southern Uplands ESA. This is designated for the purpose of protecting and enhancing environmental features of the area by the maintenance or adoption of agricultural methods. The ESA is unavoidable for all substation siting areas due to its extent.
	Designated Sites	There are no designated sites located within SS4, however, Red Moss SSSI and SAC is located approximately 300m to the south-west (on the other side of the B7078). Construction impacts such as noise can be mitigated through good practise methods and are not considered to result in a development constraint.
Cultural Heritage	Scheduled Monuments	There are three Scheduled Monuments within 3km of Substation Siting Area 4.
	NSR Sites (HER national importance)	There are two NSR Sites within 3km of Substation Siting Area 4: an enclosure (possibly of prehistoric date) and a mound (of indeterminate date) (HER references 10054 and 13295 on Figure 1.7).
	Non-designated heritage assets (HER sites)	There are no non-designated heritage assets within 200m of SS4.

[3] https://www.southlanarkshire.gov.uk/download/downloads/id/4147/landscape_designations_report_november_2010.pdf

Criterion	Sub-Criteria	Substation Siting Area 4 (SS4)
	(regional/local importance) (green circles on Figure 1.6)	
Watercourses and Flood Risk	Watercourses	There are no 50m watercourse buffers located within SS4.
	Flood Risk	SS4 is not located within an area associated with flood risk.
Land Use	Mineral Sites	SS4 is not located within a mineral site allocated in the South Lanarkshire Local Development Plan 2 (Adopted April 2021).
Technical Considerations	Future Connections	Connectivity of the proposed Glenmuckloch to ZV Route 400kV overhead line likely to be possible from west, passing north of, or through, the existing Middle Muir and Andershaw Wind Farms. Connectivity from further north-west around the north of the proposed Bodinglee Wind Farm would likely require paralleling of existing ZV route alignment and/or the B7080/NCN 74 before connecting into substation site (located between ZV109 and ZV110).
	Access (motorway, A and B Roads)	SS4 can be accessed directly from the B7078 (>150m). Access will be subject to detailed design considerations.
	Other technical constraints (overhead lines and underground cables)	There are no technical constraints effecting SS4.
Overarching Preference	The overall preference when balancing the environmental and technical considerations set out above is for SS4 as this site is the preferred site from a landscape and visual perspective where it would sit on lower lying terrain and would have the potential for both embedded and additional mitigation provided by the existing landform, minimising earthworks. The visibility from the Douglas Valley SLA will also be limited by intervening landform at siting area 4 and is not located in close proximity to any existing residential properties. Siting area 4 is also free from flood risk and is not constrained by existing OHL/UGC infrastructure.	